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IV.—*Journey from Little Namaqualand Eastward, along the Orange River, the Northern Frontier of the Colony, &c. &c., in August,* 1856. By ROBERT MOFFAT, Esq., F.R.G.S., Government Surveyor.

Communicated by the COLONIAL OFFICE.

Read, February 8, 1858.

IMPRESSED with the notion that, as the Orange River has been declared the permanent boundary of the colony, and was still unexplored, a knowledge of its geographical position would be valuable, and that a correct map of it, incorporated with that last sent, would enable the Colonial Government at least to arrive at an approximate estimate of the extent of its waste lands still available, I resolved to construct one on my homeward journey from Namaqualand to Kuruman. His Excellency the Governor, Sir George Grey, F.R.G.S., on hearing of my intentions, unexpectedly afforded me some encouragement by offering to assist me in defraying the expenses of it. Having availed myself of this liberality, I consider it my duty to send the map, and the following memoranda explanatory of it, to the Royal Geographical Society.

I shall proceed to give a short journal of my route before noticing other subjects.

I left Gams on the 13th of August, and, instead of taking the direct road to the boat ford (scuit-drift), made arrangements for keeping the river in order to ascertain its course. As the lung sickness was prevailing in the mining locality, which I had just left, I found myself compelled to dispose of my team of oxen and to hire others at different stages, an arrangement I afterwards had reason to regret, as I was thereby subjected to the caprice of my drivers. The first team I hired as far as the scuit-drift, and, crossing the Kabass Hills at Pofadder, struck the river first near 'Oboop (lat. 28° 54′), an immense valley, the lower part of which was covered with the most extensive array of aloe-trees I ever beheld. The spring, exuding from a bed of travertin, is about a mile from the river and very brack. On the 19th we reached Amam Peak (s. lat. 28° 49′). Next day, the waggons passing on, I rode down to 'Norusep, a lay-place on the bank of the river, where were two families of Namaquas and one of Bushmen, living in a degraded state. They informed me that there was still an hippopotamus or two in the bend to the west. Passing another "lay-place," on the river E'nap, we halted at Reenkreek. On the 21st, leaving the river at another called Stijerkraal, we remained the night on the plain (lat. 28° 39′); on the 22nd, at a prominent peak (lat. 28° 37′), 8 or 9 miles N. of the great peak called 'Arnam, which must be visible at a considerable distance; on the 23rd and 24th, in a sand channel, which we excavated for water (lat. 28° 36′ 45″); while here I rode down to a thermal spring, in the bed of the river, called 'Oa 'Ames, and found a Bastard family from "Nousi," and one old man from Pella, making use of its waters, and was informed that it is much frequented in the summer season, and had always been used by the Namaquas: having no thermometer with me I did not examine it. As the river was daily expected to flood, the invalids were growing apprehensive and were about to return home. Commencing again on the 25th, we reached the scuit-drift 'Orodoup (lat. 28° 30′ 45″); on the 26th, saw a small horde of Bushmen hunting springboks, hundreds of which they contrived to surround on the edges of precipitous rocks, and thus secure a great number: here, my drivers, having fulfilled their engagements, returned to Pella with their oxen. I had been hoping to procure other oxen here, and to keep the south bank of the river, to De Neus ford, so as to examine the colonial lands bordering on it; but I saw no hope of being enabled to do so leisurely; and as all were in daily expectation of the river filling I judged it the more prudent course to cross, especially as by not doing so I should be subjecting myself to a six months' detention on the colonial side. A report having come from the country, E. of the Aintas R., that numerous droves of elands had come from the Kalagare to that neighbourhood of the river, a hunting party was about to start from Nousi and to cross at De Neus ford, but it was evident their movement would be hurried; moreover, I wished to see the Aintas at its junction with the Orange River, as it had never been laid down. I crossed the stream in a dilapidated old boat, made of willow. After taking the waggon to pieces I happily met here with an enterprising native of the Bok family, and entered into an engagement with him that he should convey the waggon to Blydeverwacht, and to take the high road round the Noup table-lands as far as Oros, and at the same time provide me with a competent guide, so as to enable me to keep the N. side of the river on horseback or foot. On the 1st September we continued our journey and halted on the high-lands (near a coppie, lat. 28° 27′), passed a place called Oubes (or Africaner's Kraal), where the London Missionary Society had a mission in 1818. The ruins of the Mission-house were still to be seen, and arrived at 'Names (or Blydeverwacht), where I found the Rev. Mr. Thomas and his family, of the Wesleyan Society. This little tract of country is still in the possession of the Africaner family; but its chief jonker resides in the neighbourhood of Walwich Bay. There were several enterprising Bastards here, anxious to establish themselves and turn its capabilities to account, but were unable to procure a footing, so that the most promising individuals, to whom the Missionary has to look for co-operation, are living there by sufferance.

On the 8th of September I left 'Names, the waggon taking the circuitous road, and my guide and self the bridle path, along the southern base of the 'Noup-plateau, keeping the river in view most of the way on the right. In the evening we reached Noup ford (lat. 28° 26′ 20″), where we met a few families of Namaquas belonging to the above village. Next day, procuring one of them as a guide, we traversed the most rugged path it was ever my lot to travel. The fetlocks of our horses were actually bleeding through being so repeatedly bruised. At one point I ascended the plateau, in order to take a few distant bearings. Late in the afternoon we reached the embouchure of the Aintas, at a spot called 'Oos, and, to my surprise, I found it not more than 80 or 90 feet wide, with a deep sand-bed fringed with the usual river trees. In the evening we proceeded along a beautiful sand-channel, parallel with the river, to a spot nearly opposite 'Araga-noup Peak (on the other side), where we bivouacked for the night (lat. 28° 27′).

On the 11th, reaching the bank of the river over against the peak, and keeping it for a few miles, we passed another village of miserable Namaquas. In this interval we saw some fresh traces of the hippopotamus, and were informed that there were still two of these animals lurking about this part of the river. In the afternoon we again travelled among some rugged hills, by a bridle path scarcely passable for a horse, and along several sand-channels studded with mimosas and other river-trees, and, about sunset, reached the neighbourhood of the fall, of which men have heard so much. It being too late to proceed in search of the fall, the noise of which we could faintly hear, we rested for the night on the bank of one of the lateral channels of the river (lat. 28° 33′ 45″). Next morning, we saw, about a mile to the southward, a small column of spray, which led us to our object: this we reached, after crossing several channels, full of standing pools, and two rapid streams. I need not say that it was a very grand object, and must be still grander with a full river. I did not know whether to consider the fall itself, with the beautiful cascade on the left and the granitic boss on the right, or the deep chasm below, with its parallel and precipitous walls and the now apparently insignificant stream meandering below, the grander object. Immediately around we had a chaotic assemblage of rocks and boulders, tossed into every position, and perforated on the surface with waterworn holes, from the size of a cup to that of a caldron, some of them very deep and still containing water, showing that the rocks we traversed to reach the stand point were frequently covered with agitated waters. After lowering myself as far as I could to get a commanding view of it, to the dismay of my guide (who every moment expected to hear a splash into the chasm below), and with its spray slightly wetting the paper, I contrived to make a careful sketch of the fall by means of a camera lucida, and to fill in the details by the naked eye. Not having provisions to enable us to delay so as to indulge in a better survey of this interesting portion of the great river, on the 12th we continued our journey along it, passing numerous Koranna lay-places, not frequented at this season. In the evening we passed several of their villages, and reached a place called 'Ai'aras (or Roodkop), over against Rhinosterkop, on the opposite bank (lat. 28° 41'). From Roodkop I saw to the S.E. the junction of the wooded channel of the Hartebeest River with the Orange, 4 or 5 m. distant. On Saturday, the 13th, we arrived and remained the sabbath at a Koranna village, near a high mountain opposite De Neus ford (lat. 28° 43', about), from which I took some distant bearings. On the 15th we reached the village of Jan Cupido, a petty captain, at a point where the river, here very wide, forms an elbow. On the 16th, by the high road, avoiding many villages, we gained, with our tired horses, the werf of one Pampier. On our way, the ruins of the church, built by the impostor Stefanus,* were pointed out to us on the opposite bank, and, a little more to the E., the former station of the London Missionary Society, called Oorlams Kraal or Bethesda, abandoned in 1821. On the 17th, passing 'Oros, a small village of Namaquas, I arrived at the waggons at a place called Dabus (lat. 28° 26' 30''), where the party who had conveyed me had concluded his agreement, and intended to spend a few days hunting on the border of the Kalagare; but rains falling to the N., followed by refreshing winds from that quarter, dissipated all their hopes immediately, for the game, gladly snuffing the cool air, speedily migrated to their wonted pastures in these unexplored wastes: the two, therefore, returned with their oxen to 'Names.

At Dabus I delayed a long time in expectation of oxen from Kuruman, which I had directed should be sent by a certain date. The river, having risen, was impassable; and, being unable to leave the waggon with so many straggling Korannas in the neighbourhood, I could not extend my explorations from this point. Unable to wait longer, I endeavoured to collect a team of Koranna oxen, and succeeded: these I hired as far as Witsand. Hearing that the Griqua chief, Waterboer, whose boundary reached to Eis, was very strict regarding the passage of strange cattle through his territory on account of the lung sickness, I was compelled to abandon my intention of keeping the river beyond that point; and fearing that I should be put to considerable expense by persisting in my plan, I decided on taking a N.E. course on my arrival there. We reached Uisip (lat. 28° 23′) on the 30th October, and a little beyond met with messengers from the Kuruman, bringing the intelligence that oxen could not be sent, as it was my intention to pass through Waterboer's territory, where oxen from that quarter were not permitted to travel. These messengers, who were Bechuanas, had come the direct road from Kuruman at the wrong season, and had been five days without water. I afterwards found, that on approaching the river they had become so faint and mentally bewildered that they lost each other in the open plain, and found the stream at spots 2 or 3 m. apart. East of Uisip I found very few Koranna villages, the majority of the people having crossed the river for fear of the cattle sickness. We arrived at Eis on the 4th of November, passing a place called 'Aba aap (lat. 28° 47′). We then took the Witsand road, with the Schurvebergen to our left and the Langebergen to our right. On arriving there and sending back the hired oxen, leaving the waggon in charge of a native, I kept the base of the latter range for about 30 m. on horseback, and crossed them a little beyond Andries Fontein. My horses knocking up a few miles beyond, I walked another 30 or 40 m., and arrived at Khatue, where I procured fresh horses, and crossing the Gamohan range arrived at Kuruman on the 14th of November, after an absence of two years from my family.

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* For an account of this man, *see* Campbell's 'Travels,' part i. p. 537.

The position of Gams, my starting point, was ascertained by a running triangulation from Vogel Klip and Ouberg (Mr. Maclear's two northernmost beacons). All my observations of lat., which were in every case of stars on both sides of the zenith, were made with a sextant, kindly lent me by Mr. Maclear. Bearings, backward and forward, most of the way were taken with a small portable theodolite. I made three attempts at taking the long. by observation of moon-culminating stars, with a very good portable transit instrument; but did not in any case succeed, on account of my watch stopping so frequently, and the consequent difficulty of ascertaining even the rate, which afterwards discouraged me from making an attempt. Otherwise, I should also have succeeded in observing two or three occultations.

My having fixed the lateral limits of the course of the Orange river correctly, and the meridional positions of the junctions of the Aintas and Hartebeest rivers approximately, will, I trust, be some trivial contribution to geographical science.

Physical Structure of the Country, including that traversed on my last Journey from Colesberg to Namaqualand.

It is very difficult to convey an adequate or even a right notion of the physical structure and conformation of an extensive tract of country without proper sections. These I had not the means of providing correctly, viz., the relative vertical elevations, but shall endeavour to convey my meaning without.

Little Namaqualand, or rather the mining locality, is evidently the nucleus of an extensive metamorphic district, if I may judge by the concentric appearance of the various lines of strike which I crossed, and the average dip of the rocks to the E., which is nearly vertical. Had I previously seen enough of this to enable me to form some conception of it of this nature before commencing my journey, I should have made an effort to note all the lines of strike and variations of dip ; for with such a specific object in view, curiosity would have prompted me to expend a good deal of labour in order to see whether it were really the case. As a description of the conformation of the mining district would occupy a lengthy paper, I shall commence with the country about Pella.

It will be necessary for us to picture to ourselves a wide table-land of nearly vertical metamorphic rocks extending considerably to the eastward from this place, and capped with a horizontal stratum of coarse sandstone rock, as far as about E. long. 20° 30′, where these sandstone rocks begin to increase in dip as you proceed eastward as far as E. long. 22° 30′ (showing intervening beds of another nature), where the dip begins to be reversed, and suggests the existence of an extensive primitive basin, but in the outcrop of which the strata appear to thicken, and other subcumbent rocks to be developed as you advance as far, say, as E. long. 25°.

We must farther picture to ourselves this whole region as having undergone great denudation, and the western side of this basin as being laid bare, so as to be traceable only by a few detached hills, and the whole of the sandstone platform in the W. side of it, with the exception of that which now forms the Noup plateau, completely removed, and the crystalline table-land laid entirely bare and furrowed down to a certain draining line, leaving only hills of mere indurated rock, and groups of black conical hills of greenstone (the subterrane disturbing agent), all which appear to increase in height as the drainage deepens.

And, finally, let us picture to ourselves this draining line or channel intersecting the said basin, furrowed down to a greater depth by that denudation, or subsequent periodic floods, so as to touch the surface of the metamorphic table-land below, at Uisip, and thence westward to run along the surface of this table-land between the superincumbent sandstone hills for a distance of 70 m., deepening gradually but little, and widening irregularly from 500 yards to 1½ or 2 m., as it divides into numerous channels reticulating from countless islets, many of these again joining the main stream, where, forming a few rapids, it is suddenly precipitated about 90 ft. into a deep chasm about 80 ft. wide (and say 150 ft. below the bed of the upper channel), with parallel and precipitous walls extending apparently a few miles, and which seems to have originated in a great fissure at right angles to the strike of the metamorphic beds—the other fugitive streams passing the main fall in several lateral channels, which converging again join the chasm below, leaping over the edge, of which they form several beautiful cascades, and the reunited waters in a lower bed meandering among rugged peaks till they approach the sea; and we shall be able to form an indistinct conception of the conformation of the region in the neighbourhood of the great Orange River.

That such a crystalline table-land once existed there is every probability, and such portion of it as remains appears to extend considerably to the S.E.; for, about 160 m. from the waterfall in that direction, at a place called Jonker Water, passed on my westward journey, I discovered the saliferous horizontal rocks of the colony, thinning out upon nearly vertical metamorphic schists (strike mag. N.), at an elevation rather higher than the bed of the river where it intersects the Doornbergen; and about 130 m. S.S.E. of the fall, I found on the same journey a formation evidently subcumbent to the above saliferous shales, the lowest stratum of which was a conglomerate resting on abraded and polished granite, and filling what seemed to be a depression in the metamorphic rocks. Moreover, the lateral water-partings of the river are of an uniform height with the more elevated outliers and groups of hills which skirt the channel: for instance, the highest hills about Pella and Gams are, I believe, considered by Mr. Maclear on a level with the great area of the flat near Ouberg (which I afterwards saw formed the water-parting), viz., about 3600 ft. As the country about Little Namaqualand has undergone great disturbance, the rocks in those highest stations are at a dip. The surface of our metamorphic table-land has only been preserved entire in such instances as the Noup plateau, which suddenly rises higher than the rounded and abraded summits of the river hills, and is capped with a perfectly horizontal stratum (apparently) of sandstone between 50 and 60 ft. thick, altogether forming a fine object to the view of the traveller from the S.W.; I should suppose the elevation of this plateau to be about 4000 ft.

The waterfall is a grand object, and the appearance of the sides of the chasm and the aspect of a group of black conical hills of greenstone about 5 m. below on the left bank testify that a fissure must have existed in which the broad waters of the river found a vent; and that that rock was the subterrane disturbing agent which formed it. Compact gneiss is the rock which the river channels traverse immediately at the waterfall (strike true N. dip, say 90° E.). One side of the fissure still remains perfect, and presents on the left bank of the fall a gigantic boss of granite with a perfectly vertical wall, over the round top of which the exfoliating masses are gradually becoming displaced. A cascade on the right bank of the fall at right angles to it is formed by one of the lateral channels before described as passing the fall. I could see the polished lips of two others on the edge of the chasm, on the left bank some way below. As stated in the journal, it was with difficulty that I crossed two of these streams, and several dry channels on the N. side, to reach my stand point; so that there can be no doubt that at the time of my visit three cascades were in full operation on the left edge of the chasm independently of the main fall; and when the river is full, there must be at least ten beautiful cascades W. of the fall in simultaneous operation, all formed by the lateral streams converging to the edge of the chasm at various intervals, and thus circumventing the main fall; and the dimensions of the streams precipitated at this point must be still grander and terrific. But to see them all at one view would be next to impossible, or even to reach the main fall at such a juncture would be hopeless without a pont, and even with one, dangerous. I did not examine this interesting locality so much as I could have done had two or three hours more been permitted me.

The circumstance of the river, for a distance of 70 m. above the waterfall, varying in width from 500 yards to between 1 and 2 m., and forming numerous channels and islands, will perhaps be accounted for by my supposition, that in that interval it runs along the upper surface of the metamorphic rocks.

The great basin (or portion of a most extensive formation) to which I have alluded as perceptible, while we proceed eastward from the waterfall, is evidently a primitive one, for we find, for some distance, three or four varieties of rocks* dipping to the E., and at the Schurvebergen (of sandstone) the dip is reversed, and as we proceed, decreases, revealing in succession in descending order, sandstone (composing the Langebergen), ribboned schists and mountain limestone (composing the Gamohan range), and then again between Kuruman and Motito and beyond the latter sandstone evidently much disturbed and fused by basalt. Here the dip is only about 5°, while, at the Schurvebergen, it is nearly vertical, and also in the Langebergen; but in many parts of the latter I observed it to be about 45°. What other rocks may occur in the interval, covered with sand, between these parallel mountain ranges, it would require more careful investigation to discover; and I think that if we had proceeded still more to the E., we should have met with the above-mentioned rocks again in ascending order on the western outcrop of another great basin of the same formation, and probably found a complete section of all the later rocks before approaching the E. coast. I have seen the limestone alluded to occurring on the Doornbergen with these beds 4 or 5 m. thick of interstratified shales, with the superincumbent ribboned schists, dipping to the N. at an angle of 45°, and this satisfies me that the southern curve of this basin is intersected by the Orange River, so that a portion of it falls within the colony between that and the Hartebeest River.

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* I regret to state that specimens of some of these which I had collected for the S. A. Museum were thrown away unintentionally by some of my servants on the latter part of my journey. When absent from the waggons I found amygdaloid disturbing this portion of the basin.

Having found no fossils except in the horizontal rocks of the colony, and a few very recent beds, I have no guide for determining the relative ages of older rocks which have come under my notice; but assuming this basin to be a portion of the great carboniferous formation of the southern continent—the main portion of which, with its coal-beds, if there be any, must be developed to the E., and most probably on the seaboard—I shall be able to give some notion of its relation to other rocks which I have examined. The great horizontal formation of the colony is, I believe, considered to be equivalent with the new red sandstone of Europe, and, as above stated, I found saliferous shales (apparently horizontal) thinning out on the surface of nearly vertical crystalline schists. As I proceeded westward on my journey through Bushmanland, I found these shales extended the whole distance; in them I met with no fossils, except what appeared to be corals on the surface of large calcareous masses (presenting horizontal concentric rings of spar), and nodules parallel with the general bedding; numerous foot-prints of birds were everywhere visible. But as I approached Krom River valley (S.E. of Little Namaqualand), I observed they had a gentle dip, say 5° to the eastward, and overlying in descending order in the valley,

1. Sandstones.
2. Shales including ferruginous nodules.
3. A conglomerate, the base of which was a grey marly stone, including spheroidal concretionary nodules of the same material of various sizes, and numerous thin seams rather harder than the base-pebbles and angular fragments of mountain limestone, presenting a weathered appearance, detached and cemented together in masses; fragments of slate resembling the ribboned schists surmounting the mountain limestone (before alluded to). Amygdaloid fragments of all the crystalline rocks from the size of a pea to that of a ton weight, and basalt. The upper portion was sparsely disseminated with small fractions of above rocks. Hollow ferruginous nodules, the base presenting a scoriaceous appearance,

and containing thin veins of gypsum. The whole appeared at Dekop, where I examined it, to be about 200 ft. thick.

4. Abraded or polished granite, with a very uneven surface, supported the whole.

It was evident the rocks thus described occupy a great depression in the metamorphic table, and are newer than those which compose the basin described, and older than the saliferous formation of the colony, and bear a great resemblance to the Permian rocks of Europe, if we may be permitted to judge by included fragments in the absence of fossils. If my conjectures hold good, it will probably be found that in South Africa they are conformable with the secondary formations and unconformable with the carboniferous, unless they prove to occur otherwise to the E.

Another important fact is, that in all the horizontal formations of the colony which I have examined (chiefly on the N. side), the volcanic rocks have only had the effect of hardening such parts of the strata as they have pierced: the result is that all the outliers of plateau and small ranges composed of these rocks owe their existence to this circumstance; for whether we examine the country from Toverberg, near Colesberg, to Dekop in Krom River Valley, or Platberg, near Harrismith, and Mosheshe Mountain, both in the neighbourhood of the Drakenberg, we shall find almost every hill or range with a nucleus or backbone or capping of basalt, the absence of volcanic rocks in the greater portion of the area having facilitated more complete denudation; whereas, in the older rocks, sandstone with pebbles traversed in my last journey have been disturbed, and, in some instances, partially fused, so as to resemble puddingstone. At Uisip, I found amygdaloid the disturbing agent, and at Motito and Lattakoo (east of Kuruman *) great quantities of basalt, which had so altered the sandstone that I mistook it for amygdaloid till I observed the structure of the pebbles included.

Of the more recent formations (tertiary and post-tertiary) occurring in the neighbourhood of the above-mentioned older formations, and especially along the river, I shall be able to give only a similar desultory account.

I entertain little doubt that if all those spots and hollows called vleys, pans, floors, and saltpans, which are found all over Bushmanland, were examined, alternate beds of salt, gravel, and marl would be found. The existing saltpans are considerably more hollow than the others, and are, perhaps, frequently silted. Many of these saltpans are fed by springs of brackwater exuding from

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* These places may be seen on one of my maps in the possession of Mr. Arrowsmith.

the saliferous beds in which they occur and by long valleys which convey summer torrents. One spot I examined, called Vogel Vley, evidently formerly a lagoon which had burst its barriers, and found under a cliff facing the N. a thin bed of marl a few feet below the surface, containing fresh-water shells (apparently *Paludina*) and covered with the débris forming the talus of the cliff. My journey through Bushmanland was performed in great haste, so that I was unable to indulge in a further search for fossils.* On the surface of the mountain limestone in the neighbourhood of the Kuruman (Lattakoo), I have found, among the accumulations of travertin around a spring (called Mapoteū), several freshwater shells about the same size (probably *Succinea*).

Along the Orange River recent deposits are very insignificant in extent. West of the waterfall, in what may be called the lower draining-line of the river, large accumulations of calcareous matter (in beds alternating with others of a frangible, and, when dry, powdery structure) occur in such valleys as 'Oboop, Pella, and Henkries. From the presence of common salt, which appears to be abundantly disseminated in them, one would suppose these deposits to have been effected in waters connected with the sea. From their homogeneous and highly-concentrated nature, it is, at all events, natural to infer that they were effected in tranquil water, and formed sheltered bays or inlets from an arm of the sea which, so far inland, would, of course, be subject to the river currents. The great valleys of Pella and 'Oboop are connected with the river-gap by means of very narrow gorges, the one a mile, and the other 4 miles in length. The Henkries valley, again, in which the deposits are more extensive, laterally opens out at once into the river-gap. The beautiful terraces of these deposits in this valley—of which there are three or four—suggest the idea of successive and sudden changes in the level of the country. Common and other salts abound also in the thermal springs so numerous in this metamorphic district: these chiefly occur in dislocations. On my journey, I met with two in the bed of the river.

It is difficult to say whether the immense quantities of carbonate of lime found in these deposits are to be traced to the metamorphic rocks which are drained by these valleys, or chiefly to the waters of the Great Orange River, which contain large quantities of it in solution, from the fact of many of its tributaries traversing limestone; for on all the higher lands composed of those old rocks are to be found innumerable small accumulations of travertin, lumps of which, when fractured, show a concentric structure, formed, no doubt, by the percolation of rain-water through the sand, which is intermixed with grains of lime.

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* The whole of the surface deposits of Great Bushmanland are thoroughly impregnated with common salt, therefore the waters contained no pools; vleys and beds of river channels are always freshest after the rains, as the water lessens in depth in proportion to the surface it covers; it increases in saltness till it becomes perfect brine.

Above the waterfall, again, detached portions of (what appear to have been formerly continuous) river-terraces, nearly as far as Uisip, are found resting on the surface of the vertical metamorphic schists and beyond on sandstone, and are composed of a breccia, a base of travertin, with angular fragments and rounded pebbles of ribboned stone. The upper surfaces of these terraces are apparently about 100 feet above the present bed of the river. From the fact of my finding waterworn pebbles of this rock (ribboned schist) at the distance of several hundred yards, and, in some cases, a mile from the river, I am led to suppose that it has been subject to great floods. The uniformly level surface of some of these terraces (which have, no doubt, been destroyed by the torrents from the adjacent country, from which small draining channels intersect them in every direction), where portions of them remain entire, suggests the probability of their having been deposited in comparatively tranquil waters; if so, it is not unlikely that the river from Uisip to the waterfall once presented the appearance of a long serpentine lake, in the middle of which the river-current flowed.

I had not an opportunity of examining the river above Eis, but from Bull Fontein to Brieschap I found the substratum of the river-terraces resting on the sloping base of the argillaceous hills (ribboned schists), which overlie the limestone on the s., to be composed of a fine blue conglomerate, passing upwards into a coarser, both including small waterworn pebbles and rounded fragments of the limestone, and pieces of crystalline rock and shales, altogether about 50 feet thick; upon this rested a bed of breccia, with a base of travertin, similar to that before described, in some places 4 or 5 feet thick, no doubt accumulated under water when the bounds of the river were narrowed. I afterwards observed that the valleys, by the drainage of which these rocks were deposited, revealed in succession, as I ascended them, ribboned schists, mountain limestone, crystalline schists, and the saliferous shales resting unconformably upon these.

There is, however, a deposit peculiar to the whole of the Orange River from the junction westward, which now fills up such gaps as have been formed by the removal of the greater part of the river-terraces and covers the islands. This is a very rich mud, which when dry is an almost impalpable powder. It is this which supports the dense bush which fringes the banks of this stream and its spreading channel, and covers the island for a distance of 70 miles below Uisip. At the mouth of the Aintas I found a great quantity of this deposited from the waters of the Orange, which sometimes rise to a considerable distance in the channel of the former river. In the cracking mud at the bottom of the channel of this river which intersects these deposits, I found nodules of older and hardened mud, which had, no doubt, been torn up from the old bed by a debâcle.

Even in the nature of this most recent stratum, as well as in many facts before-mentioned, there are evidences that the country is undergoing desiccation; for on the N. bank of the river, which we kept for a few miles E. of the 'Araganoup Peak, my guide pointed out to me the track of his party's waggons some fifteen years ago (this could be perceived wherever it had crossed a ridge and where they had cleared away the stones) on the banks, which were then bare of trees; but the bush had now become so dense that it was difficult to traverse them even on foot.

But this subject, the gradual desiccation of the continent, is one for which abundant illustrations could be found, and which alone would occupy a lengthy paper.

There is another point of interest which bears upon the nature of the deposits along the Orange River, and especially upon the character of those in operation in the sea-bottom fed by this river, but perhaps would be better enlarged upon in a paper on the above-mentioned interesting subject, viz., the relative extents of the draining surfaces and distances of the sources of the main tributaries of the Great Orange River. Regarding this river, extending from E. long. $24\frac{1}{2}^{\circ}$ to the sea, as the main trunk, it may be said to have five of these, viz.:—

	Drainage Surface in Square Miles, about	Distance of Sources.
The *Oup* or *Fish* River	52,000	400 miles.
Aintas River	140,000	400 ,,
Hartebeest River	50,000	270 ,,
Vaal (including the *Hart*)	55,000	400 ,,
Black River (commonly called the Orange), including the Caledon	28,000	400 ,,
Square miles	325,000	Extent of Surface of the Hydrographical basin of the Great Orange R.

Of these five, the three first named, though draining three-fourths of the great hydrographical basin, are merely occasional rivers, with dry channels containing here and there standing pools, and the other two permanent streams, containing sometimes in very dry seasons little more water than a sturdy rivulet. The former are filled by sudden thunderstorms, and come down in immense floods,* sweeping everything before them. Of the three, perhaps the Hartebeest River, with its broad, level bottom, which receives the drainage of the Sneeuwbergen, carries down the greatest quantity of water; and the two latter (the Black and the Vaal, coming from the high lands of the E., with their fountains, frequent rains and snow) alone cause the channel to remain full for several months, and frequently the whole year. It is remarkable that the Aintas, the junction of which has now for the first time been shown, and the tributaries of which drain the Kalagare wilderness—which I hope yet to explore—though draining a surface of country almost equal to any three of the other valleys, supplies the main trunk with the least water. The mouth of this river was actually not more than about 80 or 90 feet wide when I crossed it. These facts may, perhaps, be ascribed to the prevalence of so many sand-dunes in the neighbourhood of its tributaries. Such sand-dunes are so numerous in the country between the river and the mining locality in Little Namaqualand, that it is difficult to trace the draining-line of a very large valley there.

I have reason to regret that I had not the means of ascertaining the elevations of the various formations alluded to, viz., the sandstone platform of Noup, which I ascended at two points, the waterfall, the junctions of the Aintas and Hartebeest rivers, and the numerous river-terraces, as I should otherwise have been able to append a correct section from the sea to Kuruman.

If, however, my remarks and observations only serve to point out to men better qualified to survey the structure of a country suitable localities in which to examine the varying formations, I shall be able to congratulate myself for having at least made myself useful.

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* On one occasion (I am informed) in the *Fish* River, Great Namaqualand, so sudden was one of these floods, that a tiger and an antelope which had come down to different standing pools of its channel to drink, were in succession suddenly caught up by it and carried away till entrammelled in a tree, where both could be seen terror-stricken gazing at one another.